Claims

1. A pulsed power system for supplying pulsed power to a load, the pulsed power system comprising an inductive energy storage circuit including a current source and a plasma opening switch, the plasma opening switch having a transmission line coupling the current source to the load for supplying current to the load, the transmission line extending away from a first region toward a second region near the load, the plasma opening switch having a closed state and an open state, the plasma opening switch changing from the closed state to the open state when a plasma discharge in the plasma opening switch is driven by magnetic force from the first region toward the second region;

wherein the pulsed power system includes electrical conductors arranged for providing a stabilizing magnetic field configuration in the first region to magnetically latch the plasma discharge in the first region during charging of the inductive energy storage circuit with current from the current source, and current flowing along the transmission line from the current source to the load tends to disrupt the stabilizing magnetic field configuration and unlatch the plasma discharge from the first region and drive the plasma discharge toward the second region.

2. The pulsed power system as claimed in claim 1, wherein the first region is magnetically insulated when the plasma opening switch is in the open state and conducting current from the current source to the load.

3. The pulsed power system as claimed in claim 1, wherein the stabilizing magnetic field configuration includes a multi-pole configuration of electrical conductor elements providing a local minimum of magnetic force upon the plasma discharge in the first region when the plasma opening switch is in the closed state.

4. The pulsed power system as claimed in claim 1, wherein the electrical conductors arranged for providing a stabilizing magnetic field configuration in the first region the second current path includes a pair of parallel-spaced conductors disposed between the second region and the first region, the plasma discharge passing between the parallel-

spaced conductors when the plasma opening switch changes from the closed state to the open state.

5. The pulsed power system as claimed in claim 1, wherein the electrical conductors arranged for providing the stabilizing magnetic field configuration are in the inductive energy storage circuit and carry current from the current source to the plasma discharge when the plasma discharge is in the first region and the plasma switch is in the closed state.

6. The pulsed power system as claimed in claim 5, wherein the electrical conductors arranged for providing the stabilizing magnetic field configuration include at least one electrical conductor in a first current path for carrying a first current component tending to magnetically force the plasma discharge toward the second region when the plasma discharge is in the first region, and at least one electrical conductor in a second current path for carrying a second current component tending to magnetically force the plasma discharge away from the second region when the plasma discharge is in the first region.

7. The pulsed power system as claimed in claim 6, wherein the inductive energy storage circuit is configured so that when the plasma opening switch is in the closed state and the inductive energy storage circuit becomes charged by the current source, the difference between the first current component and the second current component is an increasing function of time so that the stabilizing magnetic field configuration becomes destabilized for switching of the plasma opening switch from the closed state to the open state.

8. The pulsed power system as claimed in claim 7, wherein the current source includes at least one electromechanical generator and the first current path includes a first winding of the electromechanical generator and the second current path includes a second winding of the electromechanical generator.

9. The pulsed power system as claimed in claim 6, wherein the first current path has a first resistance and the second current path has a second resistance, and the second resistance is greater than the first resistance.

10. The pulsed power system as claimed in claim 6, which includes a trigger pulse generator coupled to at least one of the first and second current paths for applying a trigger pulse to increase the difference between the first current component and the second current component to destabilize the stabilizing magnetic field configuration and thereby switch the plasma opening switch from the closed state to the open state.

11. The pulsed power system as claimed in claim 10, wherein the trigger pulse generator includes a capacitor and a closing switch coupled to the capacitor for applying the trigger pulse by closing the closing switch to discharge the capacitor into the inductive energy storage circuit.

12. The pulsed power system as claimed in claim 10, wherein the plasma opening switch includes at least one pair of spaced electrodes in the first region for supplying current to the plasma discharge when the plasma discharge is in the first region, and at least one isolation device connecting at least one of the electrodes to the transmission line, the isolation device having a relatively high resistance when the plasma discharge is in the first region and the plasma opening switch is in the closed state, and the isolation device having a relatively low resistance when the plasma opening switch is in the open state.

13. The pulsed power system as claimed in claim 12, wherein the isolation device includes a closing switch.

14. The pulsed power system as claimed in claim 12, wherein the isolation device includes a varistor.

15. The pulsed power system as claimed in claim 12, wherein the isolation device has a relatively low incremental resistance for an applied voltage in excess of a threshold voltage, the threshold voltage being greater than a voltage required for sustaining the plasma discharge across the spaced electrodes in the first region when the plasma switch is in the closed state.

16. The pulsed power system as claimed in claim 1, which includes means for initiating the plasma discharge in the first region.

17. The pulsed power system as claimed in claim 1, wherein the first region is annular and the plasma discharge in the first region includes an array of plasma discharge elements.

18. The pulsed power system as claimed in claim 17, wherein the plasma opening switch includes an annular insulator structure comprised of solid dielectric material in the neighborhood of the first region, the annular insulator structure having an array of slots including a respective slot for containing each of the plasma discharge elements.

19. The pulsed power system as claimed in claim 18, wherein the plasma opening switch includes an array of electrical conductor elements disposed in the solid dielectric material between the first region and the second region for producing a magnetic force on the discharge elements tending to push the plasma discharge elements away from the second region, each of the electrical conductor elements being disposed in the solid dielectric material between a pair of neighboring ones of the slots.

20. The pulsed power system as claimed in claim 1, wherein the plasma discharge in the first region includes at least one array of plasma discharge elements, the plasma discharge elements in said at least one array including a first plasma discharge element furthest from the second region and a last plasma discharge closest to the second region, the plasma discharge elements in said at least one array being coupled to each other so that opening of the first plasma discharge element causes a sequential opening of the other plasma discharge elements in said at least one array.

21. The pulsed power system as claimed in claim 1, wherein the transmission line is a component of a plasma flow switch.

22. The pulsed power system as claimed in claim 1, wherein the transmission line is a component of a plasma focus device.

23. The pulsed power system as claimed in claim 1, wherein the transmission line is a component of a sphereomac device.

24. The pulsed power system as claimed in claim 1, wherein the current source is a compensated alternator.

25. The pulsed power system as claimed in claim 1, wherein the current source is an explosively-driven magnetic flux compressor.